

What is claimed is:

1. A multi-tracking method, comprising the steps of

(a) providing a plurality of portable multi-tracking units, wherein one of said portable multi-tracking units acts as a host unit while the other portable multi-tracking units act as client units;

(b) providing host position data of said host unit by a positioning unit of said host unit;

(c) receiving client position data and client identifications of said client units through a wireless communication public network, so as to provide said host unit with client locations of said client units; and

(d) sending said host position data and a host identification of said host unit via said wireless communication public network, so as to provide said other client units with a host location of said host unit.

2. The multi-tracking method, as recited in claim 1, wherein the step (a)

further comprises the steps of:

(a.1) retrieving map data from a map database stored in a storage device of each of said portable multi-tracking units to provide a map; and

(a.2) displaying said map on a displaying unit of each of said portable multi-tracking units.

20 3. The multi-tracking method, as recited in claim 2, wherein the step (b) further comprises the steps of:

(b.1) processing said host position data to achieve said host location; and

(b.2) displaying said host location of said host unit on said map on said displaying unit of said host unit.

4. The multi-tracking method, as recited in claim 3, wherein the step (c)

5 further comprises the steps of:

(c.1) decoding said client locations received from said client units to achieve said client locations thereof; and

(c.2) displaying said client locations of said client units on said map on said displaying unit of said host unit.

10 5. The multi-tracking method, as recited in claim 4, wherein the step (d)

further comprises the steps of:

(d.1) decoding said host location received from said host unit to achieve said host location by each of said client unit; and

15 (d.2) displaying said host location of said host unit on said map on said

displaying unit of each of said client units.

6. The multi-tracking method, as recited in claim 5, wherein each of said portable multi-tracking unit comprises a wireless communication module adapted to create and maintain a communication link between said host unit and said client units.

7. The multi-tracking method, as recited in claim 6, further comprising the

20 steps of:

(e) collecting voice data from a microphone of each of said host and client units;

(f) encoding said voice data by a system processor of each of said host and client units;

(g) sending said encoded voice data through said wireless communication module of said host unit to said client units so as to enable each of said client units to
5 access said encoded voice data of said host unit;

(h) receiving said encoded voice data from said wireless communication module of each of said client hosts;

(i) decoding said voice data by said system processor of said host unit; and

(j) sending said decoded voice data to a speaker of said host unit so that a
10 host user of said host unit is capable of hearing hear what said client users are talking.

8. The multi-tracking method, as recited in claim 6, further comprising the steps of:

(e') collecting video image from a video camera of each of said host and client units;

15 (f') encoding said video image by a system processor of each of said host and client units;

(g') sending said encoded video image through said wireless communication module of said host unit to said client units so as to enable each of said client units to access said image data of said host unit;

20 (h') receiving said encoded video image from said wireless communication module of each of said client hosts;

(i') decoding said video image by said system processor of said host unit; and

(j') sending said decoded video image to said displaying unit so that a host user of said host unit is capable of viewing what said client users are doing.

9. The multi-tracking method, as recited in claim 7, further comprising the steps of:

5 (k) collecting video image from a video camera of each of said host and client units;

(l) encoding said video image by said system processor of each of said host and client units;

10 (m) sending said encoded video image through said wireless communication module of said host unit to said client units so as to enable each of said client units to access said image data of said host unit;

(n) receiving said encoded video image from said wireless communication module of each of said client hosts;

(o) decoding said video image by said system processor of said host unit; and

15 (p) sending said decoded video image to said displaying unit so that a host user of said host unit is capable of viewing what said client users are doing.

10. The multi-tracking method, as recited in claim 5, wherein said positioning unit is a GPS receiver.

11. The multi-tracking method, as recited in claim 9, wherein said positioning unit is a GPS receiver.

12. The multi-tracking method, as recited in claim 5, wherein said positioning unit is an IMU positioning device.

13. The multi-tracking method, as recited in claim 9, wherein said positioning unit is an IMU positioning device.

14. The multi-tracking method, as recited in claim 5, wherein said positioning unit is an integrated GPS/IMU device.

5 15. The multi-tracking method, as recited in claim 9, wherein said positioning unit is an integrated GPS/IMU device.

16. The multi-tracking method, as recited in claim 5, wherein said position data is a three dimensional vector of (x, y, z) coordinates in an Earth-Centered-Earth-Fixed (ECEF) coordinate system.

10 17. The multi-tracking method, as recited in claim 9, wherein said position data are three dimensional vector of (x, y, z) coordinates in an Earth-Centered-Earth-Fixed (ECEF) coordinate system.

18. The multi-tracking method, as recited in claim 5, wherein said position data include latitude, longitude and altitude coordinates in a Geodetic coordinate system.

15 19. The multi-tracking method, as recited in claim 9, wherein said position data include latitude, longitude and altitude coordinates in a Geodetic coordinate system.

20. The multi-tracking method, as recited in claim 1, 5 or 8, after the step (a), further comprising a step of receiving user commands from an input device.

21. The multi-tracking method, as recited in claim 20, wherein said user commands include viewing a map, displaying said locations of said client units relative to said host, sending messages, scheduling trip, activating autonomous navigation functionality, and locating an address.

22. The multi-tracking method, as recited in claim 5, wherein said wireless communication module of each of said host unit and client units further receives client identifications and inquiring commands.

23. The multi-tracking method, as recited in claim 9, wherein said wireless
5 communication module of each of said host unit and client units further receives client identifications and inquiring commands.

24. The multi-tracking method, as recited in claim 5, further comprising a step
of selecting one or more specific client users from said client users by choosing said
client identifications of said specific client users to view said client location of said
10 specific client user.

26. The multi-tracking method, as recited in claim 7, further comprising a step
of selecting one or more specific client users from said client users by choosing said
client identifications of said specific client users to view said client location of said
specific client user.

15 27. The multi-tracking method, as recited in claim 8, further comprising a step
of selecting one or more specific client users from said client users by choosing said
client identifications of said specific client users to view said client location of said
specific client user.

28. The multi-tracking method, as recited in claim 5, further comprising a step
20 of disabling an accessibility of said client location of one or more of said client units.

29. The multi-tracking method, as recited in claim 7, further comprising a step
of disabling an accessibility of said client location of one or more of said client units.

30. The multi-tracking method, as recited in claim 8, further comprising a step
of disabling an accessibility of said client location of one or more of said client units.

31. The multi-tracking method, as recited in claim 5, wherein a predetermined number of said portable multi-tracking units is grouped to form a user group, wherein said host unit is selected as a group server and said client units are group members, wherein said host unit receives said client locations of said client units and broadcasts
5 said client locations to said client units respectively, while each of said client units only receives said host location from said host unit but does not receive said client locations of said other client units directly, wherein each of said client units receives client locations of said other client units from said host unit.

32. The multi-tracking method, as recited in claim 7, wherein a predetermined number of said portable multi-tracking units is grouped to form a user group, wherein said host unit is selected as a group server and said client units are group members, wherein said host unit receives said client locations of said client units and broadcasts
10 said client locations to said client units respectively, while each of said client units only receives said host location from said host unit but does not receive said client locations of said other client units directly, wherein each of said client units receives client locations of said other client units from said host unit.
15

33. The multi-tracking method, as recited in claim 8, wherein a predetermined number of said portable multi-tracking units is grouped to form a user group, wherein said host unit is selected as a group server and said client units are group members,
20 wherein said host unit receives said client locations of said client units and broadcasts said client locations to said client units respectively, while each of said client units only receives said host location from said host unit but does not receive said client locations of said other client units directly, wherein each of said client units receives client locations of said other client units from said host unit.

25 34. The multi-tracking method, as recited in claim 31, wherein more than one user groups are presented and said group servers exchange said host and client locations thereof with each other through said wireless communication public network.

35. The multi-tracking method, as recited in claim 32, wherein more than one user groups are presented and said group servers exchange said host and client locations thereof with each other through said wireless communication public network.

36. The multi-tracking method, as recited in claim 33, wherein more than one 5 user groups are presented and said group servers exchange said host and client locations thereof with each other through said wireless communication public network.

37. A portable multi-tracking system, comprising:

a system processor;

10 a positioning unit, which is connected to said system processor, providing current host position data of said portable multi-tracking system, wherein said position data includes position, velocity, and heading of said portable multi-tracking system;

15 a storage device, which is connected to said system processor, storing an electronic map database and other interim data including said host position data and a host identification, wherein map data is capable of being retrieved by said system processor from said electronic map database of said storage device;

20 a wireless communication module, which is connected with said system processor, for receiving client position data and client identifications of other client portable multi-tracking systems which are linked with said portable multi-tracking system through a wireless communication public network, and sending said host position data and said host identification through said wireless communication public network to said other client portable multi-tracking systems, so as to provide said portable multi-tracking system with client position data of said other client portable multi-tracking system, and to provide said other client portable multi-tracking system with said host position data of said portable multi-tracking system; and

a display device, which is connected to said system processor, for displaying said map data in form of a map, wherein said map data is retrieved by said system processor from said storage device, moreover said host position data and said client position data are processed in said system processor to form a current host location and client locations
5 respectively, which are overlayingly displayed on said map displayed on said display device.

38. The portable multi-tracking system, as recited in claim 37, wherein said wireless communication module is also arranged for broadcasting said client position data received from said client portable multi-tracking systems.

10 39. The portable multi-tracking system, as recited in claim 37, further comprising an input device, which is connected to said system processor and acts as an interface for a user to intervene in a system operation of said portable multi-tracking system for inputting said user commands and said interim data.

15 40. The portable multi-tracking system, as recited in claim 38, further comprising an input device, which is connected to said system processor and acts as an interface for a user to intervene in a system operation of said portable multi-tracking system for inputting said user commands and said interim data.

41. The portable multi-tracking system, as recited in claim 39, wherein said input device is a keyboard.

20 42. The portable multi-tracking system, as recited in claim 39, wherein said input device is a software keyboard coupled with a character recognition system.

43. The portable multi-tracking system, as recited in claim 39, wherein said input device is a touch screen coupled with corresponding software to identify said user commands.

44. The portable multi-tracking system, as recited in claim 39, wherein said input device is a microphone coupled with a voice recognition system to receive said user commands.

45. The portable multi-tracking system, as recited in claim 39, wherein said system processor is a central processing unit coupled with predetermined interfaces to said display device, said input device, said storage device, said positioning unit, and said wireless communication module, and is responsible for processing sensor positioning data, display processing, input response, remote data or command processing, sending messages, and device control and management.

10 46. The portable multi-tracking system, as recited in claim 39, wherein said wireless communication module is used to process wireless communication protocol, wireless signal detection, received data conversion, signal data amplification, modulating a digital signal to be transmitted into an analogue signal, and demodulating an analogue signal into a digital signal.

15 47. The portable multi-tracking system, as recited in claim 46, wherein said wireless communication module further comprises an antenna for converting an analogue signal into a radiative signal and converting a detected radiative signal from each of said client portable multi-tracking systems into an analogue signal which is suitable for said wireless communication module to process.

20 48. The portable multi-tracking system, as recited in claim 39, wherein said positioning unit is a GPS receiver.

49. The portable multi-tracking system, as recited in claim 39, wherein said positioning unit is an IMU.

25 50. The portable multi-tracking system, as recited in claim 39, wherein said positioning unit is a combination device of a GPS receiver and an IMU.

51. The portable multi-tracking system, as recited in claim 39, wherein said positioning unit is a land/water vehicle navigator which generates position data.

52. The portable multi-tracking system, as recited claim 44, wherein said microphone, which is connected to said system processor, detects sound wave and
5 converts said sound wave to electrical signal, wherein an electrical presentation of said sound wave is further sampled and converted into digital sound data, which digital sound data is processed by said system processor to compensate noise and reduce data size, and then said digital sound data is encoded and sent to said wireless communication module that broadcasts said encoded digital sound data through said wireless communication public network.
10

53. The portable multi-tracking system, as recited claim 47, further comprising a microphone, which is connected to said system processor, detects sound wave and converts said sound wave to electrical signal, wherein an electrical presentation of said sound wave is further sampled and converted into digital sound data, which digital sound data is processed by said system processor to compensate noise and reduce data size, and then said digital sound data is encoded and sent to said wireless communication module, which broadcasts said encoded digital sound data through said wireless communication public network.
15

54. The portable multi-tracking system, as recited in claim 52, further comprising a speaker, which is connected to said system processor, wherein when said wireless communication module receives said encoded digital sound data through said wireless communication public network and sends said encoded digital sound data to said system processor, wherein said system processor decodes said encoded digital sound data and sends said encoded digital sound data to said speaker, which converts said digital sound data to analogue signal and then said analogue signal is converted to sound wave.
20
25

55. The portable multi-tracking system, as recited in claim 53, further comprising a speaker, which is connected to said system processor, wherein when said wireless communication module receives said encoded digital sound data through said

wireless communication public network and sends said encoded digital sound data to said system processor, wherein said system processor decodes said encoded digital sound data and sends said encoded digital sound data to said speaker, which converts said digital sound data to analogue signal and then said analogue signal is converted to sound wave.

5 56. The portable multi-tracking system, as recited in claim 44, further comprising a video camera, which is connected to said system processor, capturing a video image and converting said video image to digital presentation, wherein said digital presentation of said video image is sent to said system processor to process and encode to encoded video image which is then sent to said wireless communication module for broadcasting through said wireless communication public network.

10 57. The portable multi-tracking system, as recited in claim 47, further comprising a video camera, which is connected to said system processor, capturing a video image and converting said video image to digital presentation, wherein said digital presentation of said video image is sent to said system processor to process and encode to encoded video image which is then sent to said wireless communication module for broadcasting through said wireless communication public network.

15 58. The portable multi-tracking system, as recited in claim 55, further comprising a video camera, which is connected to said system processor, capturing a video image and converting said video image to digital presentation, wherein said digital presentation of said video image is sent to said system processor to process and encode to encoded video image which is then sent to said wireless communication module for broadcasting through said wireless communication public network.

20 59. The portable multi-tracking system, as recited in claim 37, 39, 44, 47, 53, 55, or 58, wherein said system processor includes:

25 a user interface module, which is an entry for enabling or disabling a plurality of functions of said portable multi-tracking system, including wireless communication,

multi-tracking, autonomous navigation, displaying map, locating an address, and scheduling a trip;

a trip scheduler module for planning and scheduling a trip, including defining a start point, interim points, and an end point, and logging information including visiting time, appointments, contact persons, and comments;

a street locator module for displaying said map data on said display device and searching a designated place;

a map viewer module for displaying said host and client position data and enabling a predetermined area of said map to zoom in and;

10 an autonomous navigator module for outputting said host position data of said portable multi-tracking system;

a communication controller module for receiving said host position data of said portable multi-tracking system and combining said host position data with said host identification which are sent to said wireless communication module, wherein said communication controller module also receives information from said client portable multi-tracking systems; and

20 a wireless tracking module for receiving said information of said client portable multi-tracking systems sent from said communication controller module for retrieving said client identifications and said client position data which are then send to said map viewer module, wherein said map viewer module displays said client locations of said client portable multi-tracking systems on said map.

60. The portable multi-tracking system, as recited in claim 59, wherein said wireless tracker module further updates said tracking status of said client portable multi-tracking systems of interest at a constant period, alerts when losing track of a specific one 25 of said client portable multi-tracking systems of interest, and alerts for potential collision

between said portable multi-tracking system and any of said client portable multi-tracking systems when said multi-tracking system and said client portable multi-tracking systems are carried in aircrafts.

61. The portable multi-tracking system, as recited in claim 59, wherein said
5 autonomous navigator module further tracks and navigates wherever said portable multi-
tracking system goes, shows a real-time speed and direction of said portable multi-
tracking system, illustrates no-map areas including mountains, lakes, and rivers, gives a
warning message when said portable multi-tracking system is brought to travel in a
wrong way, allows a two or more points routing, provides street-to-street directions,
10 shows time and distance to destination, and programs avoidable areas;

62. The portable multi-tracking system, as recited in claim 59, wherein said
user interface provides an entry for user to select operations including position tracking,
voice tracking, and video tracking.

63. The portable multi-tracking system, as recited in claim 59, wherein said
15 wireless communication module comprises a multi-tracking mechanism which includes a
start module, an initialization module, a data reception module, a data processing module,
a data transmission module, a program termination module, and an end module,

wherein said data reception module comprises a position producer data reception
module, a communication data reception module and a user input data reception module
20 which are executed in a synchronous fashion and communicate with each other;

wherein said position producer data reception module further comprises a
synchronous module, a port data reading module, and a communication module, wherein
said synchronous module is designed to wait for an event that shows that a new position
data is ready without wasting for system processing time;

25 wherein said communication data reception module further comprises a
synchronous event module, a communication port data reading module, a data

verification module, an error checking and recovering module, a data transfer module, a send module, and a request module with a remote device, wherein said data transfer module is a type of synchronous module that communicates with a remote data processing module;

5 wherein said user input data reception module further comprises a synchronous module, a port data reading module, and a communication module, wherein said synchronous module is designed to wait for an event that shows that said new position data is ready without wasting said processing time of said system processor unit to search said port continuously;

10 wherein said data processing module further comprises a position sensor data processing module, a communication data processing module, and a user input data processing module;

15 wherein said data transmission module further comprises a synchronous sending request module, a communication port status checking module, a communication command generation module, a communication command sending module, a remote device checking module, a synchronous module to write data to be sent to said output data buffer, and a data sending module.